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adequate transportation *system* (as distinct from the chaotic conditions of the past) is measurably realized, there is little likelihood that the regulative method can withstand the pressure for out and out nationalization of the American railroads.

I. LEO SHARFMAN.

UNIVERSITY OF MICHIGAN.

SOME EFFECTS ON CERTAIN AGRICULTURAL PRODUCTS OF UNIFORM PERCENTAGE INCREASES IN FREIGHT RATES

THE policy of the Interstate Commerce Commission concerning post-war freight rate advances apparently has been to grant equal percentage increases for all commodities. This policy seems to have been adopted because of the resulting uniformity of change; the practice of charging "what the traffic would bear," which the railroads commonly adhered to in former years, has been discarded for the sake of this uniformity. No account seems to have been taken of the varying ability of different industries to meet the increased charges. In point of fact, however, if the "uniformity" desired is the maintenance of the existing price equilibrium between commodities and between localities then the change in rates must be proportioned to the relative part which freight charges play in total supply costs. The purpose of the present paper is merely to illustrate the truth of the above statement. The claim is not necessarily made that the existing equilibrium should be maintained; but this question may fairly be asked: "may not changes in freight rates be so made as to minimize their disturbance of other industries?" Admittedly there is no "normal" relationship between the prices of different commodities; factors affecting both supply and demand change so rapidly that the market is in a constant state of flux. Such a condition is essential

in a dynamic society. Nevertheless, any stabilizing of the effect of those factors which are incidental to production (such as freight charges) will tend to allow the success of the individual productive industry to depend upon its own efficiency and value to society.

During the period of rapid advancement in the scale both of wages and prices it was obviously proper that freight rates should be increased over those in force prior to 1914. An advance of 25 per cent in June, 1918 was accepted by the public in general as an adjustment clearly in keeping with conditions. On the other hand, when a second advance of 35 per cent over the 1918 rate was announced for August, 1920 conditions had changed; prices paid to farmers were declining, wages had ceased to rise, interest rates were lowering, wholesale prices were breaking in almost all lines. These disturbing factors affected different industries in varying degree and therefore the flat percentage increase in freight rates was harder for some industries to bear than it was for others.

Freight advances that are based on equal percentage increases cannot result in the same distribution of the freight burden as existed before the change, and for at least two reasons, namely:

First, different industries are always affected to varying degrees by the conditions that have led up to the change in freight rates. For this reason, altho the original rate may have been based on an equitable distribution of the burden, the increased rate may be exorbitant in some instances. Most agricultural products fell in price more rapidly during 1919-20 than did other commodities and a correspondingly heavy load was, therefore, placed upon them by the freight advance of August, 1920. This is a matter, however, of constantly shifting ground; if it were considered in the adjustment of freight rates it might lead to endless changes of schedule.

Second, freight charges represent different proportions of the total cost of various commodities. Obviously, any change in freight rates will more noticeably affect supply prices in

the case of products where freight is a large element of cost than where it is a small item.

It is with this second point that the present paper will deal. Two agricultural products that are shipped east from California in large quantities will be used for the purpose of comparison, namely, citrus fruits (oranges and lemons)¹ and dried beans. Freight charges represented nearly 35 per cent of the delivered value of citrus fruits as against 15 per cent in the case of beans, on the basis of the 1914 freight rate.

A few figures will serve to summarize the two industries and to show the relative importance of freight in each case.

	Beans	Citrus
California acreage harvested	590,000 acres (1918)	150,000 acres (1921)
Investment per acre	\$200.00	\$1100.00 ¹
Yield per acre ²	1200 lbs.	200 packed boxes
Farm value of crop	4.00 cents per lb. ³	\$2.00 per box f.o.b. ⁴
Freight charge prior to 191875 " " "	1.05 " "
Delivered value — farm value plus freight	4.75 " " "	3.05 " "
Ratio of freight to delivered value	15.8	34.4

1. "Net cost of bringing a citrus grove into bearing in 1916." Quoted from R. S. Vaile in Report of the Commission on Land Colonization and Rural Credits in California. November 29, 1916, pp. 30-32.

2. T. F. Hunt, University of California, College of Agriculture, Circular 121, p. 3. A table is shown giving (a) average yields, (b) safe estimate for business purposes, (c) good yield which competent men may hope to attain, (d) yield not infrequently obtained under favorable conditions. The figures used here are found under (b).

3. Five-year average value 1911-15 as reported by the U. S. D. A. Each annual figure is the unweighted average of the prices on the 15th of each month.

4. Approximate five-year price received by the California Fruit Grower's Exchange 1911-15 for from 60 per cent to 70 per cent of the total California crop.

The two freight rate changes of 1918 and 1920 totaled 71 per cent of the original rate. This, in effect, increased the delivered cost of each commodity, but in varying degree. In the case of beans the percentage increase for the same supply amounted to 11.2 per cent of the former delivered

1. Citrus fruits are used in this study rather than either oranges or lemons separately for two reasons. In the first place published statistics frequently refer to them together, and, in the second place, weather conditions play so large a part in the lemon market as to partially mask the effect of changing freight rates. If lemon figures were used alone, without reference to weather conditions, certain conclusions as to the elasticity of demand might be modified, but the present writer believes that the data would then be misleading. The question of elasticity of supply and demand will be referred to again later.

value, while with citrus fruits it was 24.4 per cent. The actual increases became one-half cent a pound for beans and 75 cents a box for citrus fruits.

It is evident from the above figures that the supply cost of citrus fruits was affected to a greater extent than was that of beans by the readjustment of freight rates. This lack of uniformity has been most strikingly illustrated by the president of the California Fruit Grower's Exchange ² in a comparison of the increased charge per acre of crop. On this basis, the bean crop had to pay \$6.40 per acre more for freight than formerly, while the citrus industry paid an additional \$149 per acre to the railroads. It is pointed out that \$149 capitalized at 6 per cent gives a sum of nearly \$2500, or over twice the cost of developing bearing orchards five years ago. In the case of beans a 6 per cent capitalization of the freight increase amounts to just over one-half the present value of the land.

The cost of an acre of citrus orchard so greatly exceeds that of an acre of bean land that a fairer comparison may be made on the basis of freight charged for each \$100 capital invested in the farm.

FREIGHT ON PRODUCT FROM EACH \$100.00 CAPITAL INVESTED

	Beans	Citrus
Rate prior to June, 1918	\$4.50	\$19.10
Increases of June, 1918 and August, 1920	3.20	13.55

From the above figures it is seen that if the producer pays the freight the citrus grower must carry $4\frac{1}{4}$ times the increased cost in proportion to his capital invested as compared with the bean grower. The 3.2 per cent on investment, absorbed by the increased freight in the case of beans, would take nearly all the return on capital which any agricultural enterprise can hope to average; the 13.5 per cent on investment taken by the increased freight on citrus is more than any agricultural product can stand without an offsetting increase in consumer's price. Obviously, if the grower had to pay the full

2. C. C. Teague, "Relation of Freight Rates to California's Fruit Production," California Citrograph, vol. vi, No. 10, p. 342.

increase the margin for profitable groves would be greatly raised and the supply of oranges and lemons from California correspondingly reduced. It may be pointed out again that if the freight charge is entirely passed on to the consumer the wholesale price of citrus fruits would have to increase 24.4 per cent, while that of beans would be raised only 11.2 per cent. A uniform increase in freight rates is thus seen to be entirely lacking in uniformity of effect on the two commodities.

The degree of elasticity in the supply of and demand for California products will largely determine the effect of the unequal changes in freight burden upon the two crops considered. The whole question of opportunity or substitution costs is involved, both from the standpoint of the consumer and the producer. The returns to the producer will remain constant only if all sources of supply are affected alike by the change in freight and if, at the same time, the demand is sufficiently inelastic so that the entire increase in supply cost can be added to the market price without reducing the volume of sales. It would be extremely rare, however, for all sources of supply to be affected to the same extent by a flat percentage increase in freight rates. For instance, California citrus fruits are in competition with similar fruit from Florida. Because of the shorter haul and water competition the original freight rate from Florida was less than from California and constituted a smaller proportion of delivered costs. Applying the argument already developed in the comparison of beans with citrus, a uniform percentage increase in freight rates from California and from Florida must have influenced the supply price of California fruit more than of Florida fruit. If the two competing districts were in equilibrium before the advance in rates then Florida was given an advantage by the change. The same difference exists between beans grown in California and those produced in Michigan or New York. Partly as a result of this shifting of balance in supply costs as between different sources of supply, imports of foreign lemons increased during 1920.

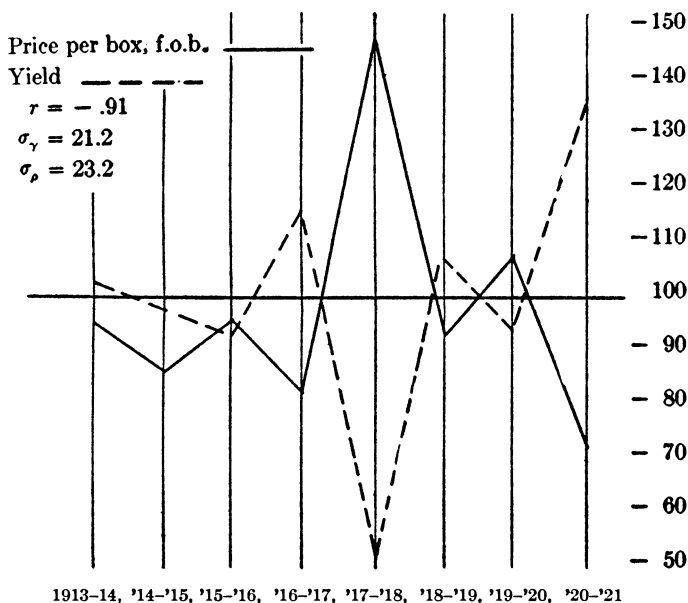
The demand for any particular agricultural product is

usually quite inelastic. This has been markedly the case with California oranges for whenever the yield has been heavy the price has been low. The relative yields and prices during the past eight years show a high inverse correlation, as illustrated in the accompanying graph.

This behavior strongly suggests that any attempt to raise orange prices to cover the increased freight charges would lead the consumer to substitute locally grown apples or something else for oranges. The farm price of beans, on the other hand, seems to have been positively correlated with the Cali-

RELATIVE YIELDS AND PRICES OF CALIFORNIA CITRUS FRUITS

Percentage deviations from an eight-year average, 1913-14 to 1920-21.



fornia yield during the past eight seasons ($r = +.56$); that is, a larger supply was consumed when prices were high than when they were low. This, however, is undoubtedly due to the stimulation of war conditions and should not be taken to mean that the increased freight rate will be paid by the

consumer without a reduction in consumption. In fact the 1921 delivered price was the lowest since 1915.

From another point of view the increase in freight becomes a disturbing element in supply costs only when it is greater, relatively, than the other elements of cost. That is, if the cost of freight for each \$100 of invested capital increases in the same proportion as the field costs or the harvesting and selling charges, then any reduction in profits³ to the producer may as properly be charged to high wages or what-not as to freight. If the total supply cost increases in the same proportion in California as in Florida it can make no difference in the California-Florida competition whether freight is a large or a small element in the cost.

A brief analysis of the production and market situations in regard to California citrus fruit is of interest in its bearing on the affect of the recent freight advances. In the present study the past eight years have been included, commencing September 1, 1913 and closing August 31, 1921. This gives nearly five full years before the first freight increase and one full year while the double increase was in force. The data have all been arranged on the basis of the cost, or value, of the product for each \$100 capital invested in bearing groves.⁴ For the present purpose the dollar seems a more satisfactory unit of land measurement than the physical acre. The following table gives the delivered price of the fruit produced on each \$100 worth of land. This figure is then resolved into its component elements of costs and returns on capital.

A consideration of the above figures shows that the citrus industry shared in the general war and post-war boom of 1917-20 and that a reaction set in during the 1920-21 season. This is in keeping with almost all lines of business

3. "Profit" is used here and elsewhere in this note to mean the total return on capital.

4. The value of bearing groves has been kept constantly at \$1100 per acre. During the brief period of high prices some average groves sold at higher figures, and the cost of bringing a grove into bearing may be more now than it was five years ago. In general, however, \$1100 is not far from the average value. This must not be confused with the price of good or exceptional groves, which occasionally sell for three or even four times this amount.

DELIVERED PRICE AND COST OF PRODUCTION OF CITRUS FRUITS
PRODUCED FROM EACH \$100 WORTH OF LAND
1913-14 TO 1920-21. YEAR SEPT.-AUG.

Year	Delivered price	Cost of freight	Cost to harvest and sell	Field costs	Net return on \$100 capital
1913-14	\$33.85	\$12.70	\$7.30	\$13.20	\$1.65
14-15	33.50	12.00	6.60	13.35	1.55
15-16	39.08	11.20	7.70	14.00	6.18
16-17	46.70	14.00	10.90	14.35	7.45
17-18	36.50	7.45	6.20	15.45	7.40
5-year ave.	38.12	11.47	7.70	14.10	4.85
1918-19	58.50	16.70	12.70	17.80	11.30
19-20	62.10	15.50	13.90	19.70	13.00
20-21	74.50	25.90	17.90	22.70	8.00

RELATIVE MOVEMENTS OF COSTS AND PROFIT DURING THE
PERIOD OF INCREASING FREIGHT RATES

Year	Cost of freight	Field costs	Net return on \$100 capital
5-year ave. 1913-14 to 1917-18	100	100	100
1918-19	146	126	232
19-20	135	136	269
20-21	226	161	161

and is beside the point in the present problem. The significant fact is the change in cost of freight compared with the change in other elements of cost. The field costs, over which the farmer has direct control, were only 61 per cent greater in 1921 than for the five-year base period (1913-14 to 1917-18), while freight charges were increased 126 per cent; that is to say, freight charges had increased more than twice as much as field costs. Such a disproportionate increase in freight costs must have resulted in an advantage to Florida shippers as against California shippers for, as already pointed out, freight is a more important element in the supply price of California fruit.

On the other hand the delivered price which was actually paid also increased more than the farmers' field costs, and just as much as the total cost of delivered fruit. Consequently the net returns on capital in 1920-21 bore the same

relationship to the five-year average as did field costs. It may be noted, however, that the profit for 1920-21 was only \$8 for each \$100 worth of orchard as against an average of \$9.16 for the five years 1915-16 to 1919-20. But as already suggested this reduction in earnings may be accounted for by the general post-war slump; also the 1920-21 crop was the largest ever produced in California and its profitability was therefore affected by the inelasticity of demand. Apparently for this one season the consumer absorbed the entire freight increase and left the producer in the same position as that held during the five-year average before the first change in freight rate.

It does not necessarily follow, however, because for one year the consumer pays the bill without forcing a reduction in consumption, that flat percentage increases in freight rates are justified. The fact remains that the supply cost of citrus fruits has been affected over twice as much by freight rate changes as has the supply price of beans. If the producer does not suffer thereby then the consumer of oranges and lemons is put at a disadvantage in comparison with the consumer of beans. While the supply of California citrus fruits is less elastic than is the case with annual crops yet the increase of the industry may be materially curtailed by a freight advance that affects California producers to a greater extent than Florida and foreign producers. Citrus fruit is high-grade freight and presumably the traffic in it is profitable for the railroads. From the standpoint of railroad policy that rate should be charged which would yield the largest product of volume of business times profit per unit. It is probable that the pre-war rate, which had been thoroly tested, was very close to this ideal point, and that the arbitrary overthrow of balance between crops and between localities will result unfavorably to the carriers. It is certainly true that several hundred acres of marginal citrus groves have been abandoned in California as a result not so much of *high* freight rates as of the new equilibrium between supply costs which the flat percentage increase in rates necessitated.

The conclusion seems evident. If "uniform" freight rate changes are intended to maintain the existing equilibrium between commodities and localities then the "uniformity" must be proportioned to the relative part which freight charges play in total supply costs. Otherwise the relative costs of commodities will be shifted with every change in freight rate and the equilibrium of supply and demand will constantly need to be reestablished.

ROLAND VAILE.

UNIVERSITY OF CALIFORNIA.